

The following amendments are requested for permit #20528:

Purpose: Proposed changes include four different project components, to determine the status of Young of Year (YOY) Atlantic sturgeon in the Great Pee Dee System (Waccamaw River), request takes of shortnose sturgeon in the Santee Cooper Lake System in anticipation of future research studies related to the Santee Cooper FERC process, to request a necessary increase in allowable take for shortnose sturgeon in the Edisto River, SC, and include blood sampling similar to the methodology included in permit # 1505 and #16438, but less invasive.

All capture methods, handling and processing, PIT tagging, Floy tagging, Genetic Tissue Sampling, Telemetry Acoustic Tagging (where applicable), Surgery Protocol (where applicable), Fin Ray Sampling, and Anesthesia (where applicable), will be conducted in a same manner as currently required in permit #20258. All sampling and handling of sturgeon will be conducted following the guidelines established in "A Protocol For the Use of Shortnose Atlantic, Gulf, and Green Sturgeon" (Kahn and Mohead 2010). All necessary precautions will be taken to ensure sturgeons are not harmed during capture and handling.

Location/Description: Great Pee Dee System (Waccamaw River).

Atlantic Sturgeon (*Acipenser oxyrinchus*) occur in the Great Pee Dee River from river mile 40 to about river mile 200 (below Blewitt Falls Dam near Rockingham, NC). Additionally, there are over 250 total miles of mainstem tributary habitat available in the Black (~120 mi), Waccamaw (~60 mi), Little Pee Dee (~50 mi) and Lynches (~30) Rivers. Mainstem channels throughout the watershed, as well as the Sampit River, Winyah Bay and contiguous channels of the Intracoastal Waterway, provide nursery habitat. YOY sturgeon may use over 300 miles of channel and adjacent waters for nursery habitat. Currently, other than anecdotal information, telemetry, some side scan results and point in time directed catch data, little is known about the status of Atlantic sturgeon in the Great Pee Dee System. A great deal has been learned over the last 5 years about the spawning population's behavior in this system (Post et al. 2014; Flowers and Hightower 2015), but little information is available regarding recruitment and abundance of YOY that contribute to that population. Recent work on Georgia Rivers has provided YOY abundance estimates using the Program Mark (Huggins model) analysis tool (Schueller and Peterson 2010; Bahr and Peterson 2016). When conducted over several consecutive years, these annual recruitment estimates depict a trend for the entire population. In order to maintain consistency with these studies, we propose to use the same methodology (small mesh gill and trammel nets) in the Waccamaw River, SC to develop population estimates for YOY Atlantic sturgeon that use this area as nursery habitat. These results will help fill in data gaps that exist for some rivers in the southeast.

Requested Take: It is anticipated that up to 150 juvenile Atlantic sturgeon (<100 cm) will be captured, tagged and released during this effort. Additionally, up to 50 juvenile shortnose sturgeon (<45 cm) are anticipated to be captured while attempting to meet the project objectives. Since this study focuses on YOY life stage and

small mesh gill nets or trammel nets are used, captures should not impact or affect ongoing sturgeon work in the Great Pee Dee River (Project No. 2206-030 and NMFS Consultation No. SER-2009- 55) to assess adult spawning populations. In fact, this work will only complement those efforts.

Location/Description: The Santee Cooper Lake System

The Santee River basin is the second largest watershed on the Atlantic coast of the United States. Through man's manipulation, the Santee is now directly connected, and biologically related, to the Cooper River. The original connection was created in the 1940s when the USCOE constructed Lake Marion by building Wilson Dam on the Santee channel at about river mile 90. A second reservoir, Lake Moultrie, was constructed by diking and was connected to Lake Marion via a Diversion Canal. Most of the historical Santee River flow was diverted through Lake Moultrie and Pinopolis Dam and via a Tailrace Canal into the Cooper River, previously a largely tidal tributary to Charleston Harbor. This convoluted project was designed to enhance shipping and industrial utilization of Charleston Harbor and the lower Cooper River.

Pinopolis Dam, located at about river mile 50, includes a navigational lock to accommodate commercial and recreational boat traffic, conceivably from Charleston to the vicinity of Columbia. As early as the 1950s, it was realized that alosids, and particularly blueback herring, were being passed into Lakes Moultrie and Marion (collectively Santee-Cooper Lakes) during lockages in late winter and spring. Originally, herring were identified as a source of forage for the famous "damlocked" population of striped bass in the Santee-Cooper Lakes, and routine lockages were initiated annually to accommodate herring passage. By the late 1970s, the USCOE determined that flows in the Cooper River were in excess of those needed to accommodate shipping and industry and that reduced flows would significantly reduce channel dredging maintenance costs. In 1985, a Rediversion Project was completed with the construction of the Rediversion Canal that rerouted much of the historical Santee River flow back into the historical Santee River channel about 37 miles seaward of Wilson Dam. In order to offset hydropower production loss at Pinopolis Dam from reduced discharges into the Cooper River, the Rediversion Project included St. Stephen Dam, which is equipped with turbines for hydropower production and with fish passage via a fish lock. Alosid passage has continued annually since 1985 at both Pinopolis Dam and St. Stephen Dam. The St. Stephen fish lock includes an observation window that allows for counts and estimates of passage by species. In general, through the combined passage routes, up to several million blueback herring and over half a million American shad have been annually passed into the Santee-Cooper Lakes over the past 15 years. Only 6 shortnose sturgeon have been passed at the St. Stephen Dam. Presumably others have passed into the lake system by the navigational lock at Pinopolis Dam. Such large animals have no means by which to reasonably move back below the lakes. Shortnose sturgeon passed into the Santee-Cooper Lakes could conceivably follow flows through about 50 miles of lake and canal habitat, thereby gaining access to nearly 135 miles of additional riverine habitat. This additional riverine habitat includes unimpounded portions of the Congaree (~50 mi) and Wateree (~75 mi) Rivers and about six miles of historical Santee River channel immediately above the headwaters of Lake Marion.

Sturgeon studies are under consideration as part of the FERC-relicensing process now underway for Pinopolis and Wilson Dams. In anticipation of those, SCDNR will again conduct telemetry and population studies and request additional takes of shortnose sturgeon in portions of upper Lake Marion, similar to what was allowed on permit #15677.

Take: It is anticipated that up to 75 subadult/adult and 5 juvenile shortnose sturgeon are expected to be captured, tagged, and released while attempting to meet the project objectives. An additional 20 adult and 5 juvenile shortnose sturgeon will be captured and receive transmitters (Vemco V-9 and V-16). NOTE: This work will only occur, if and when, Santee Cooper FERC license is reissued. A similar 5 year study was completed in 2016 as part of the Santee Accord 10-year Action Plan tasks.

Location/Description: Edisto River

SCDNR continues monitoring Atlantic sturgeon abundance in the Edisto River. This is an ongoing program that began in 1994 and is one of the few long term studies used in the 2017 stock assessment. Sampling occurs from May-October, 1-3 days/week.

Take: Because SCDNR exceeded the allowed take for shortnose sturgeon in 2017, we would like to request an increase in take for this river. Justification for this request is solely based on the premise that during high river discharge events, caused by unexpected rainfall resulting from a number of hurricanes or tropical storms, flows increase and are excessive during the sampling season, resulting in mostly freshwater (0 ppt.) at the fixed station collection site. Prolonged freshwater at the sampling site results in copious amounts of YOY Atlantic sturgeon, but also leads to higher than normal captures of shortnose sturgeon. Therefore, SCDNR requests to modify the shortnose sturgeon take for this river by increasing the number of juveniles from 5 to 10, and increasing the number of subadults/adults from 5 to 10. NOTE: During "normal" flow years or drought years, the take limit is not expected to be reached (i.e. in 2018, a lower than normal year, only 3 shortnose sturgeon have been captured).

Blood Sampling: Cooper River

It is anticipated up to 20 shortnose sturgeon > 600mm will be captured in the Cooper River for sex determination examination. After the fish is anesthetized, A 5-ml blood sample will be collected from the caudal vessels of each fish using a sterile syringe and transferred to blood collection tubes containing lithium heparin and plasma separator gel (Vacutainer and Microtainer, BD, Franklin Lakes, NJ). Blood collection tubes will be immediately stored on ice. Blood samples will be sent to Jeff Schwenter at the SCDNR. Blood samples will be analyzed in the Hollings Marine Laboratory, SC, to determine sex. Sex will be assigned by using serum testosterone concentrations measured by radioimmunoassay, as described in Braun-McNeill et al. (2007). A similar technique has been used to differentiate sex in the Persian sturgeon, *Acipenser persicus*, (Viayeh et al. 2006), the Siberian sturgeon, *Acipenser baeri*, (Cuisset et al. 1991), and the white sturgeon, *Acipenser transmontanus* (Webb et al. 2002).